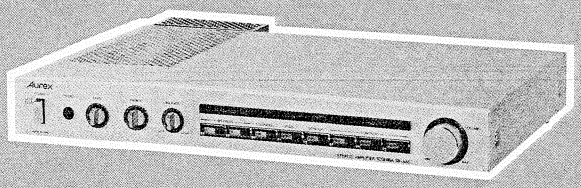
SERVICE DATA
FILE NO. 170-131

TOSHIBA

STEREO AMPLIFIER

SB-A65



SPECIFICATIONS

■ Amplifier

Continuous power output 20 Hz – 20 kHz both ch. driven:	40W x 2 (4Ω) for Europe 40W x 2 (8Ω) for U.K./Australia
1 kHz both ch. driven:	47W x 2 (4Ω) for Europe 47W x 2 (8Ω) for U.K./Australia
Total harmonic distortion (20 Hz – 20 kHz):	0.015% (at ½ rated power, 8Ω)
Frequency response:	5 Hz – 100 kHz ($\pm^{0}_{3}$dB)
Power band width (IHF):	10 Hz – 70 kHz
Load impedance:	4Ω – 16Ω for Europe 8Ω – 16Ω for U.K./Australia
Damping factor:	25
S/N (IHF A Network):	100 dB (TUNER/AUX) 72 dB (PHONO)
Input sensitivity/ impedance:	PHONO 2.5mV/47KΩ TUNER 150mV/47KΩ AUX/TAPE 150mV/47KΩ
Output level:	TAPE REC 150mV
Tone control:	BASS (at 100 Hz) ±8 dB TREBLE (at 10 kHz) ±8 dB
Phono overload level:	130mV (RMS)

■ General

Power supply:	220V – 50 Hz (4Ω – 16Ω) for Europe 240V – 50 Hz (8Ω – 16Ω) for U.K./Australia
Power consumption:	260W
Weight:	4.8 kg
Dimensions:	420(W) x 58.5(H) x 312(D)mm

Specifications are subject to change without notice.

TE, TU, AY

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1. OPERATING CONTROLS

① **Power switch**
Depress this switch to turn on power, depress again to turn power off.

② **Phones**
Plug into this jack when listening through headphones. When headphones are connected to this jack, the sound from the speakers is cut off.

③ **Tone controls**
Turn these knobs clockwise from the centre zero (flat) position to emphasize bass or treble tones. Turn counter-clockwise to attenuate (decrease) bass or treble tones.

④ **Balance control**
Turn this knob to adjust volume balance between left and right speakers.

⑩ **Peak power meter**
This meter indicates the peak (instantaneous) power output level when using 8 ohm speakers. For 4 ohm speakers, multiply the indicated readings by 2 to obtain approximate values. The meter indicates the power output level of whichever channel is producing the higher output.

⑥ **Volume**
Turn this knob to adjust the volume level.

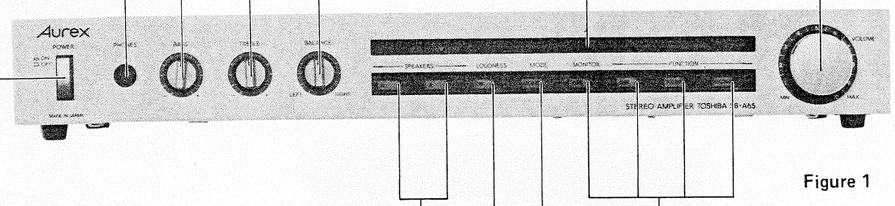


Figure 1

⑤ **Speaker selector**
A: Sound from speakers connected to rear panel terminals A
B: Sound from speakers connected to rear panel terminals B
Use this selector to select either A or B. Simultaneous use of both sets of speakers is not possible. An LED indicator in each switch lights up when the switch is depressed, to show speaker selection. Note that the selector always switches to the A position when power is turned off.

⑦ **Loudness switch**
Turn this switch on, when listening at very low volume levels to emphasize the low- and high-frequency regions. (This switch is effective between MIN and 12 o'clock position of the volume knob.) Note that this switch returns automatically to OFF position when power is turned off. When the switch is in OFF position, the LED indicator remains unlighted.

⑨ **Function selector**
TAPE: For listening to tapes. Since this is a tape monitor switch, tape monitoring is possible during recording with 3-head tape decks.
AUX: For use with any kind of audio equipment (excluding turntables and microphones)
TUNER: For listening to radio broadcasts
PHONO: For listening to records on the turntable
Note that selection switches automatically to TUNER setting when power is turned off. Its built-in LED lamp lights up to indicate which function button is depressed.

⑧ **Mode switch**
Depress this switch to MONO setting for monaural reproduction when the input signal is monaural or to convert stereo input signal to monaural form. Otherwise leave it in stereo setting (undepressed). In stereo setting the LED indicator remains unlighted.

2. SYSTEM CONNECTIONS

Note: Until all connections have been properly completed, leave the power supply cords unplugged and the power switches OFF.

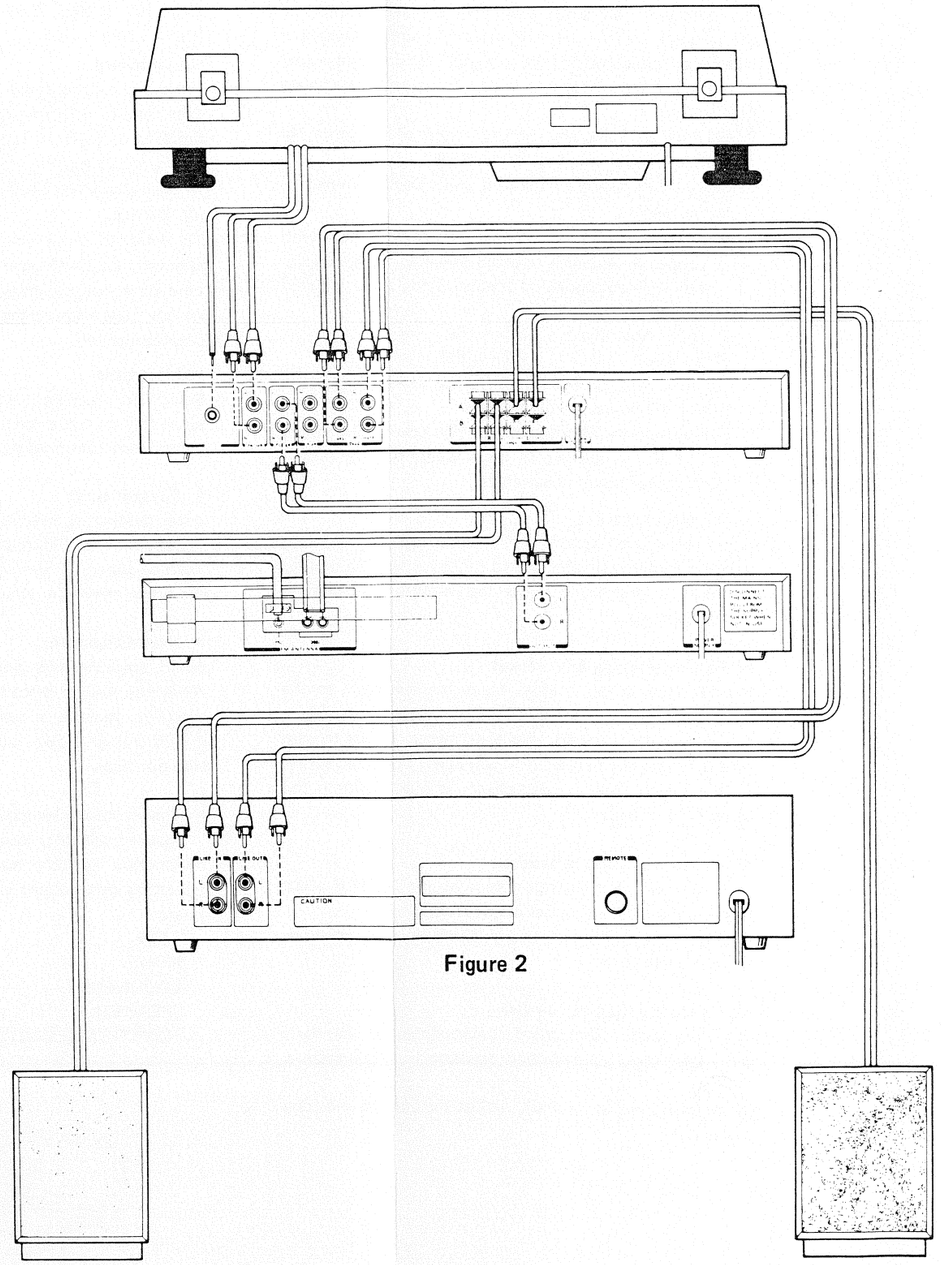


Figure 2

3. OPERATION

● **Connection of speakers to the amplifier**

Connect the right speaker cord to the "R" amplifier speaker output terminal and the left speaker cord to the "L" terminal. Be sure to connect the plus terminal of the speaker to the plus terminal of the amplifier speaker output terminal and minus to minus. Wrong connection of plus and minus results in loss of stereophonic playback sound.

* Be sure to leave the power switch of the amplifier OFF while performing connections.

* Do not short-circuit the plus and minus terminals of the speakers.

Note: When using a pair of speakers, use only those with proper impedance to avoid overloading the amplifier. Recommended speaker impedance is listed below.

U.K., Australia	8Ω – 16Ω
Europe	4Ω – 16Ω

* Confirm that the volume knob is in the MIN position before the power is turned ON.

* For best performance, consult with your dealer about use of this amplifier in areas where voltage differs from that at place of purchase.

● **To select function**

When the power switch ① is turned on, the function selector is automatically set to tuner setting. If another function is desired, depress the function selector to relevant setting.

● **To play phonograph records**

Connect the output cables from the turntable to the PHONO terminals of the amplifier. If the turntable is equipped with an earth wire or terminal, be sure to connect it to the earth wire terminal (GND) of the amplifier. If this simple task is overlooked, it may result in the generation of a hum.

● **To listen to radio broadcasts**

Connect the tuner output cables to the TUNER input terminals on the rear panel of the amplifier.
There is no special need to link the tuner and amplifier with an earth wire.

● **To use the AUX terminals**

When an audio component is connected to the AUX terminals, turn the function selector to AUX setting. Operate the connected component according to its instruction manual. Finally, adjust the volume and tone as desired.

● **Tape deck connections**

Connect the tape deck input terminals (LINE IN) to the amplifier's record terminals (REC), and the deck output terminals (LINE OUT) to the amplifier's playback (PLAY) terminals.)

(1) To record

Prepare the programme source (turntable, tuner or any other audio programme source) to be recorded, and set the tape deck in the recording mode. Note that during actual recording, the amplifier volume and tone controls will have no effect on the recording level or tone.

(2) To play

To listen to a pre-recorded tape, depress the function selector ⑨ TAPE switch and turn on the connected tape deck for playback. Since this is a tape monitor switch, tape monitoring is possible with a 3-head tape deck connected.

● **Placement**

Since this amplifier uses some parts containing fluid, place this unit at a level. If the unit is inclined over 15°, it may cause overheating.

● **Speaker cords**

After speaker connections are completed, bundle them as shown in the Figure with the binder supplied with the Toshiba tuner. If the cords come near the AM aerial of the tuner, they may affect AM reception badly.

● **Heat dissipation**

When stacking this amplifier with other equipment, always be sure to place this unit at the top. Because the amplifier radiates a significant amount of heat when driven at high power output, do not cover the ventilation openings.

● The electronic switches employed in this amplifier for speaker selector, loudness switch, mode switch and function selector automatically return to a fixed setting when power is turned off. The fixed settings are:

TAPE	→	OFF
MODE	→	STEREO
LOUDNESS	→	OFF
SPEAKER	→	A
FUNCTION SELECTOR	→	TUNER

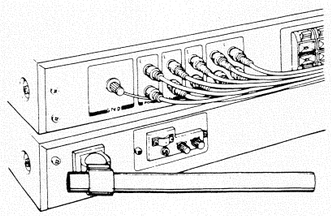


Figure 3

4. DISASSEMBLY INSTRUCTIONS

Top Cover Removal

1. Remove four screws (A) (3ϕ x 6mm) holding the top cover and one screw (B) (3ϕ x 8 mm).

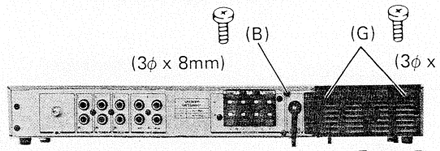


Figure 5

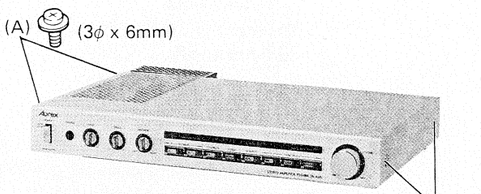


Figure 4

Bottom Plate Removal

1. Remove eight screws (C) (3ϕ x 6mm) holding the bottom plate, then the bottom plate can be removed from the unit.

Front Panel Removal

1. Remove Top Cover.
2. Remove three plastic rivets (D) holding the front panel.
3. Remove three screws (E) (3ϕ x 6mm) holding the front panel, then the front panel Assembly can be removed from the unit.

L.E.D. P.C. Board Removal

1. Remove four plastic rivets (F) (3 x 4.5mm) holding LED P.C.Board and the front chassis, then LED P.C. Board can be removed out.

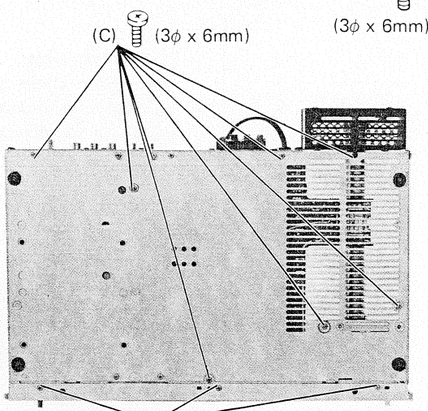


Figure 6

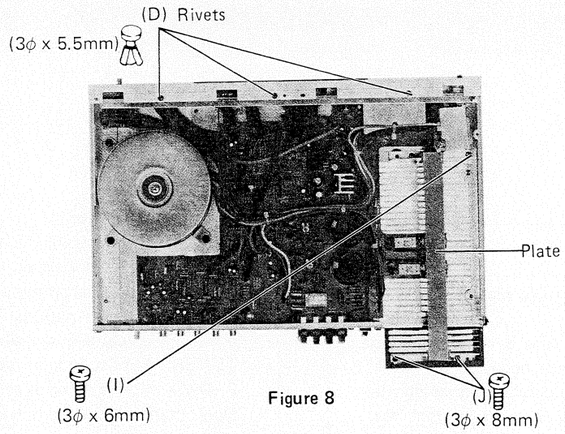


Figure 8

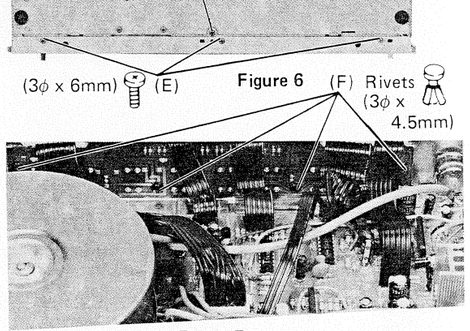


Figure 7

Transistors (Q617, 618, and the heat pipe inside part) Removal

1. Remove two screws (G) (3ϕ x 8mm) holding the heat pipe, then the cover can be removed out.
2. Remove two screws (H) (3ϕ x 10mm) holding Diodes (D604, D605) on the heat pipe, then Diodes can be removed out.
3. Take the solders (six points) of Transistor off from Main P.C. Board.
4. Remove one screw (I) (3ϕ x 6mm) and two screws (J) (3ϕ x 8mm) holding the heat pipe and pull it with keeping transistor.
5. Remove four screws (K) (3ϕ x 10mm) holding Transistor which has to be changed, then exchange Transistor.

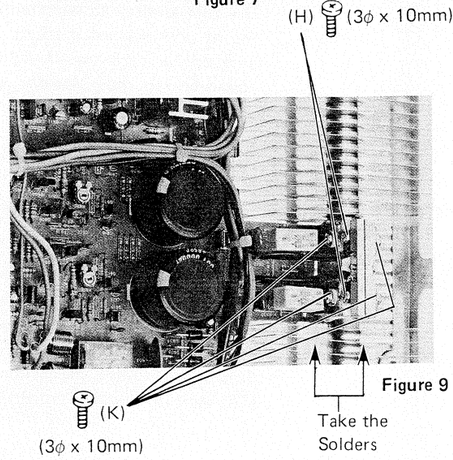


Figure 9

5. TECHNICAL INSTRUCTIONS

[1] Don't incline the equipment when using it.

If the equipment is inclined, the radiator efficiency lowers and the junction temperature of the output transistor lowers, causing a fault. The reason is explained below.

(1) Principle of the heat pipe

A newly designed part called a heat pipe is used as a radiator of the last stage transistor of the amplifier. The heat pipe is basically composed of three parts as shown in Figure 10.

(1) A fixture to conduct the heat of the transistor to an enclosed copper pipe

(2) The copper pipe containing liquid and kept vacuous absorbs the transistor heat as heat of vaporization, and transmits the heat in all directions at the rate as fast as the sound speed.

(3) The heat is radiated into the air from the blade provided at an appropriate position of the cabinet.

According to the above operation principle, the transistor heat is transmitted to the part with the high radiation efficiency (blade) at the rate as fast as the sound speed. Therefore, the high radiation efficiency can be obtained without generating noticeable temperature difference in the radiator.

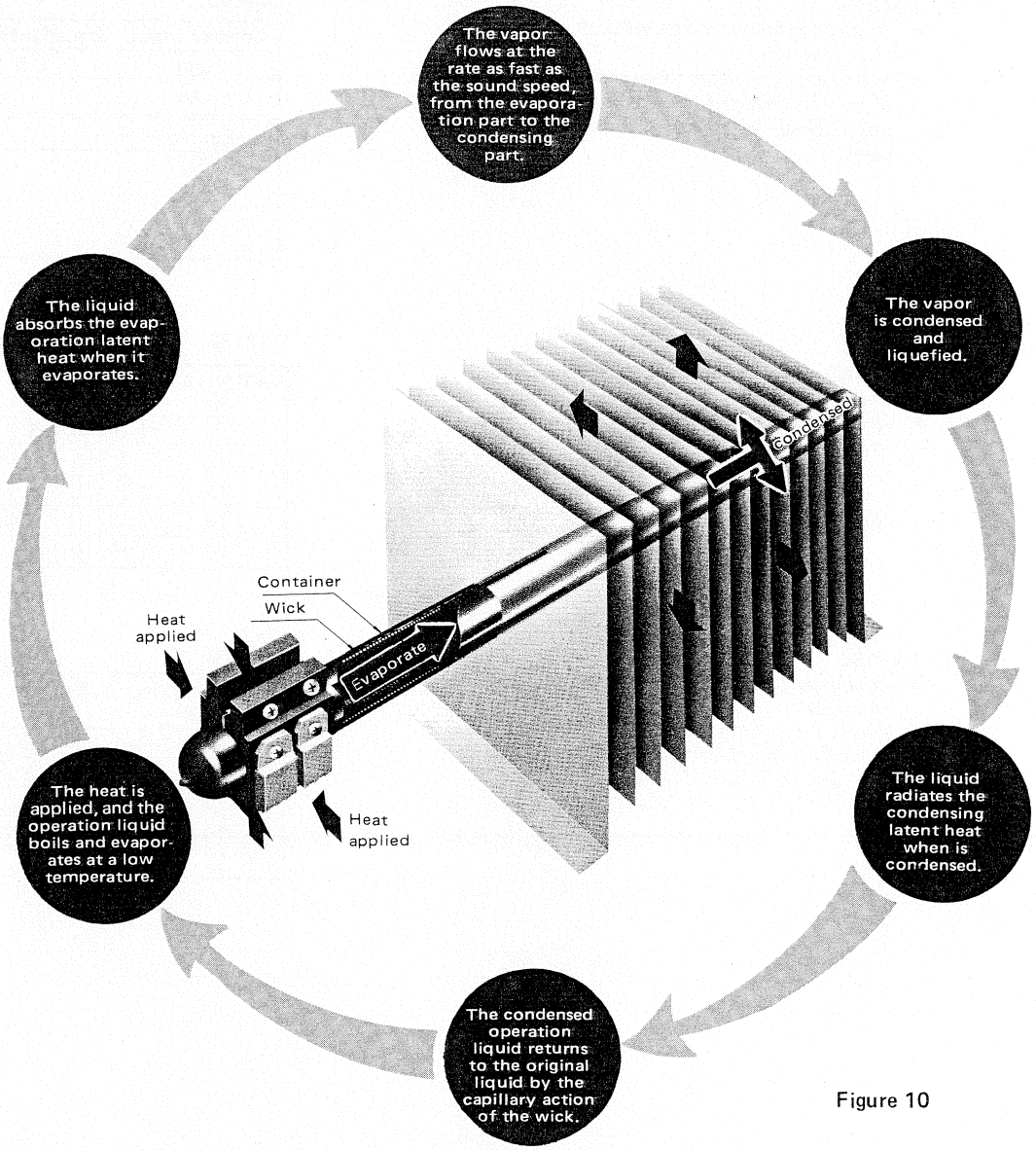

The vapor flows at the rate as fast as the sound speed, from the evaporation part to the condensing part.
The vapor is condensed and liquefied.
The liquid radiates the condensing latent heat when is condensed.
The condensed operation liquid returns to the original liquid by the capillary action of the wick.
The heat is applied, and the operation liquid boils and evaporates at a low temperature.
The liquid absorbs the evaporation latent heat when it evaporates.
Condensed
Container
Wick
Heat applied
Evaporate
Heat applied

Figure 10

(2) Position of the heat pipe

The heat pipe is located on the left side within the cabinet and set so that the pipe becomes horizontal from the front side toward the depth of the cabinet.

With this setting, the liquid contained in the pipe adheres evenly to the inner wall of the pipe and evaporates immediately after the transistor is heated.

If the pipe is inclined, the liquid stays at one end of the tipe, making evaporation difficult.

(3) Inclination and temperature

See Fig. 14. When the transistor junction temperature Tj Max. set at 123° C,the equipment can be used with the inclination of 15 °maximum. If the equipment is inclined so that the heat pipe is kept horizontal (e.g., in the lateral direction), there is no problem.

(4) Repetition of freezing

There is no problem as long as the heat pipe is set in the equipment. When the heat pipe is stored as a part and freezed/defrosted repeatedly with the pipe inclined, the liquid expands and may damage the pipe. Therefore, be sure to store the heat pipe on a horizontal place.

[2] Electronic Switches

(1) TC4066

- Dual directional switch with independent four channels.
- Impedance between the input and output of switch becomes lower with control input CIN at "H" level, and higher at "L" level.

(2) TA7177

- Changeover switch with linked four channels.
- When input terminal which is initialized to pin ⑩ chanel (tuner) is set to "L" with power on, output terminal comes to "H" level and output of other channels comes to "L".

(3) TA9130

- Changeover switch with independent four channels.
- Every time input terminal is set to "L", output terminal turns over from "L" to "H" and to "L".

[2] Truth Value Table

TC4066

Control Input	Impedance between IN/OUT
High	$0.5 \sim 5 \times 10^2\ \Omega$
Low	$> 10^9\ \Omega$

Pin No.	Pin No.
5	4/3
6	8/9
12	11/10
13	1/2

Figure 11

TA7177

Control Input Pin	Output Pin				Function
	3	4	5	6	
10	L	L	L	H	Tuner
12	L	L	H	L	Aux
14	L	H	L	L	Phono
16	H	L	L	L	No Use

Figure 12

TC9130

Control Input Pin	Output Pin				Function
	1	3	5	7	
12	*	*	*	H/L	No Use
13	*	*	H/L	*	Loudness
14	*	H/L	*	*	Tape Monitor
15	H/L	*	*	*	Mode

*No reference

Figure 13

[3] Operation

Function (PHONO, TUNER, AUX)

(1) Push PHONO key.
(2) Voltage at pin ④ of TA7177 (Q413) becomes 18.7V.
(3) Voltage is supplied to pin ⑬ of TC4066 (Q401) and pins ① and ② are electrically connected.

Tape Monitor

(1) Push TAPE key.
(2) Voltage at pin ③ of TC9130 (Q404) becomes 12V.
(3) Voltage is supplied to pin ⑬ of TC4066 (Q403) and pins ① and ② are electrically connected.
(4) Voltage at pin ⑫ of Q402 lowers from 17.5V to 2V and pins ⑩ and ⑪ are electrically cut off.

Speaker A/B

(1) Assume "A" is on. (When power is on, "A" is initialized.)
(2) Push "B".
(3) Voltage at pin ② of TA75458 becomes 16.7V.
(4) Q412 turns on, relay (L603) starts to operate and changes over to "B".

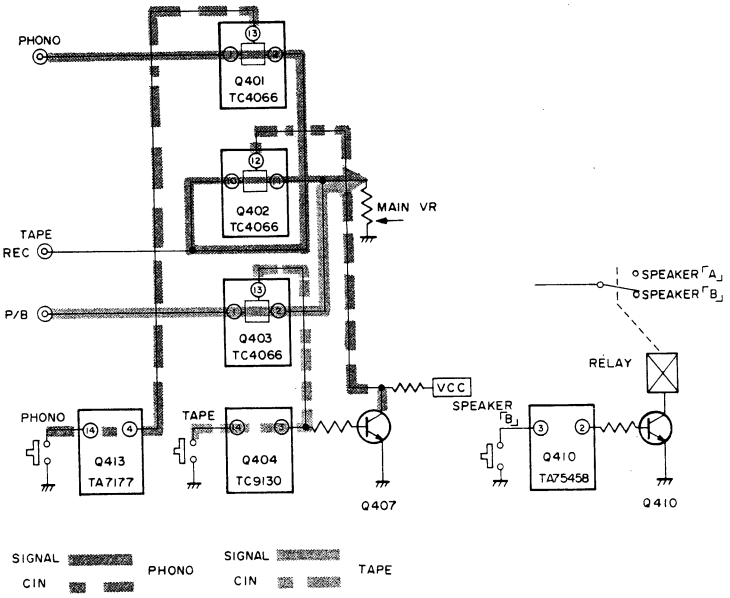


Figure 14

[4] Rack mounting

When the equipment is mounted on the rack, take space of at least 40mm above the equipment and 20mm on the left side. Avoid mounting at a narrow place close to a wall.

(1) Temperature when the equipment is enclosed

See Fig. 13. The temperature is lower than the design standard, Tj max. 125° C under the condition of B $\geqq$20 mm and A $\geqq$40 mm.
The temperature lowers further if the backside of the rack is opened or a slit is provided.

(2) To lower the temperature

Since the cabinet is slim and 50 mm in height, there are fewer place to escape the heated air as compared with the cabinet of 100 mm in height, and the cabinet is easily influenced by external conditions.
A radiator is provided on the left side of the cabinet. Therefore, set the equipment away from a wall. The tuner has radiation holes to increase the radiation effect.
The foot length is variable. It is recommendable to extend the foot to its full length if there is no problems. This lowers the equipment temperature.

Remarks: This paragraph is added unlike the description of the conventional equipment, but it never means the lowered design standard of this equipment. The equipment is designed at the same level as that of the conventional one. This paragraph is added in order to have a close relationship between the user and factory to provide the user with detailed information. For this purpose, the data of the manufacturer's side is given in this paragraph.

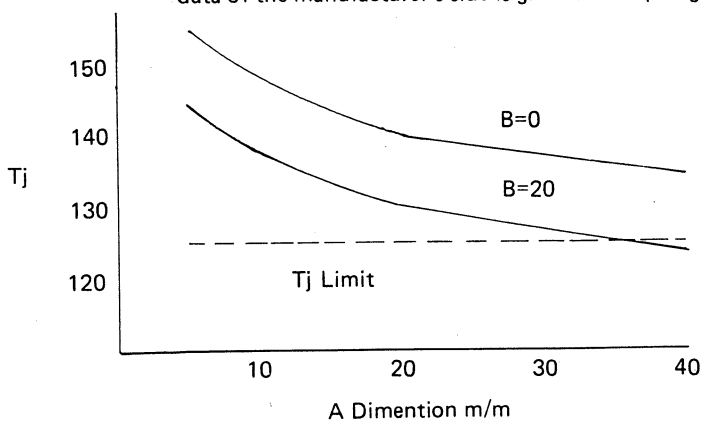


Figure 15

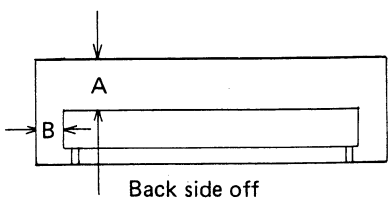


Figure 16

6. BLOCK DIAGRAM

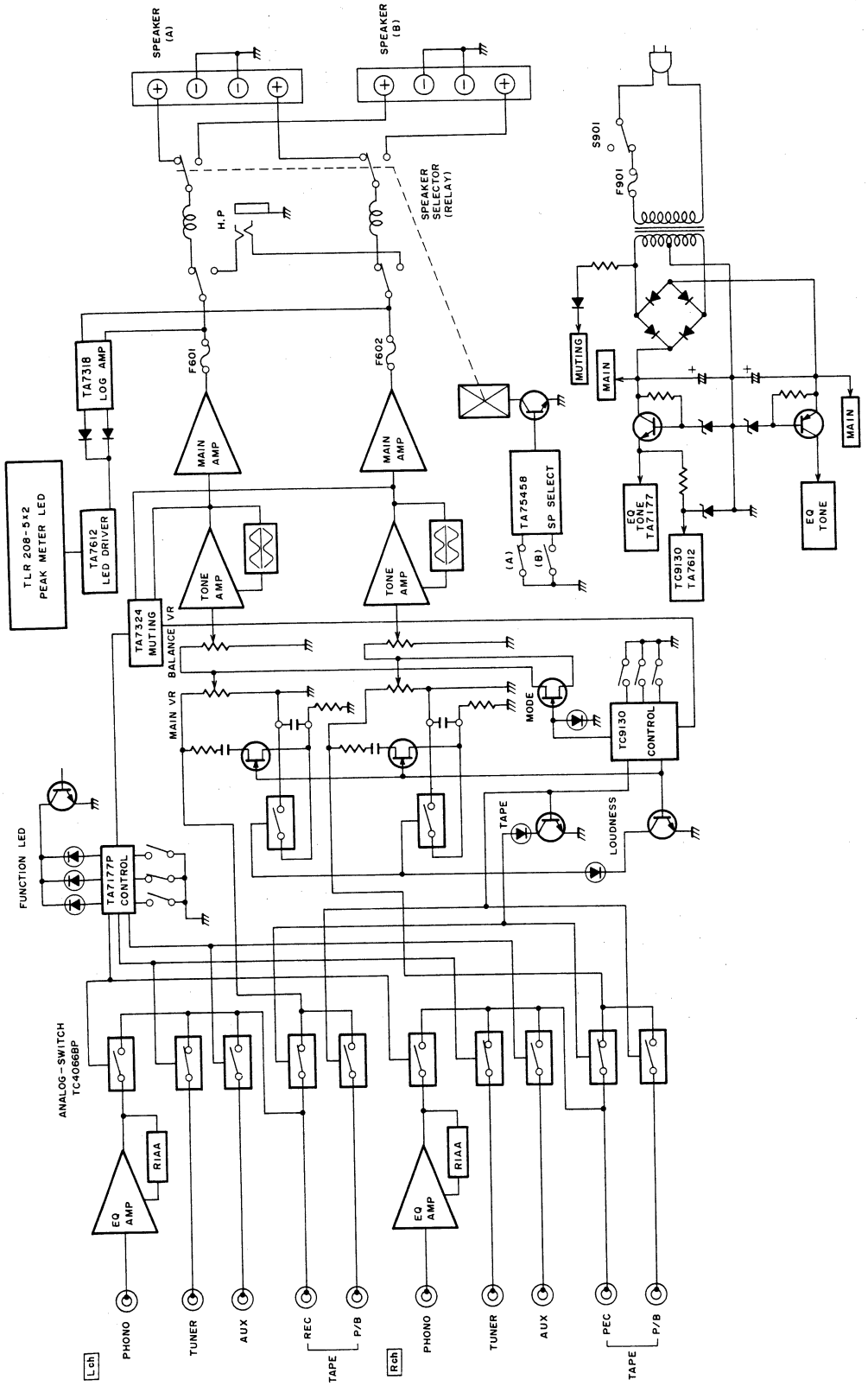


Figure 17

7. ADJUSTMENTS

IDLE CURRENT ADJUSTMENT

1. Idle current adjustment can easily be done by setting the semi-fixed VR R619, 620 (100 ohm) to mechanical mid point VR as shown in Figure 18.
2. The idle current between TP and TP must be less than 6mA when power has been on for one minute.

Peak Meter Adjustment (1 kHz)

Adjust R704 so that deflections of R ch. LEDs and L ch. LEDs should be same ones at output 2.83V (8 ohm load), 1W. Thereafter, confirm it with balance volume L and R.

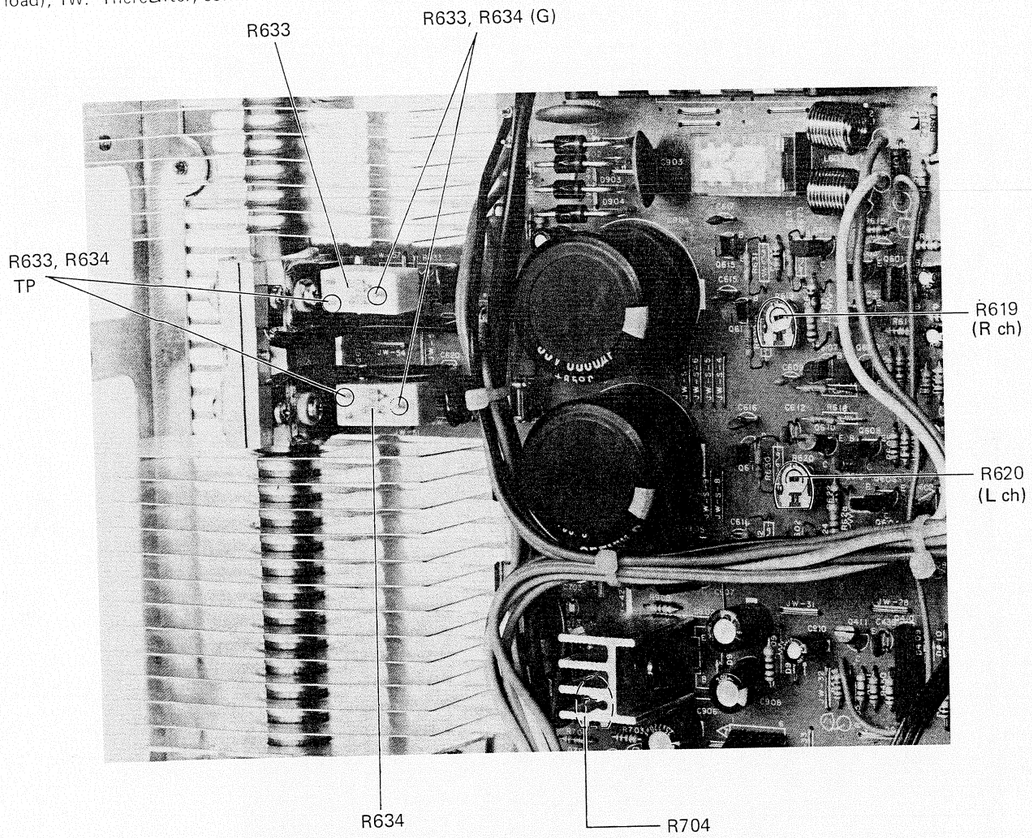
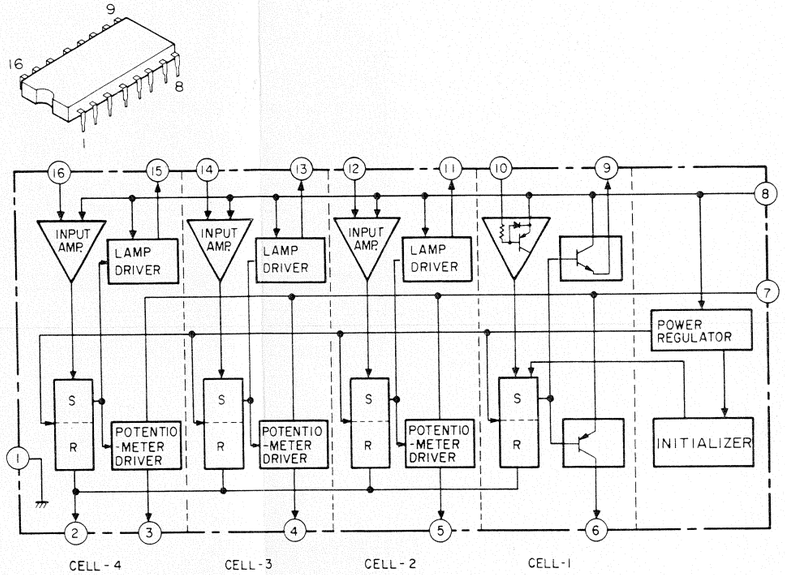


Figure 18

8.IC BLOCK DIAGRAM

TA7177P



TC9130P

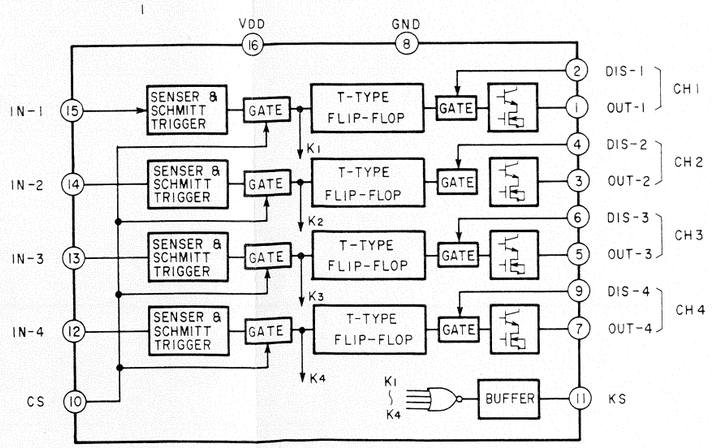


Figure 19

9. ELECTRICAL PARTS LOCATIONS

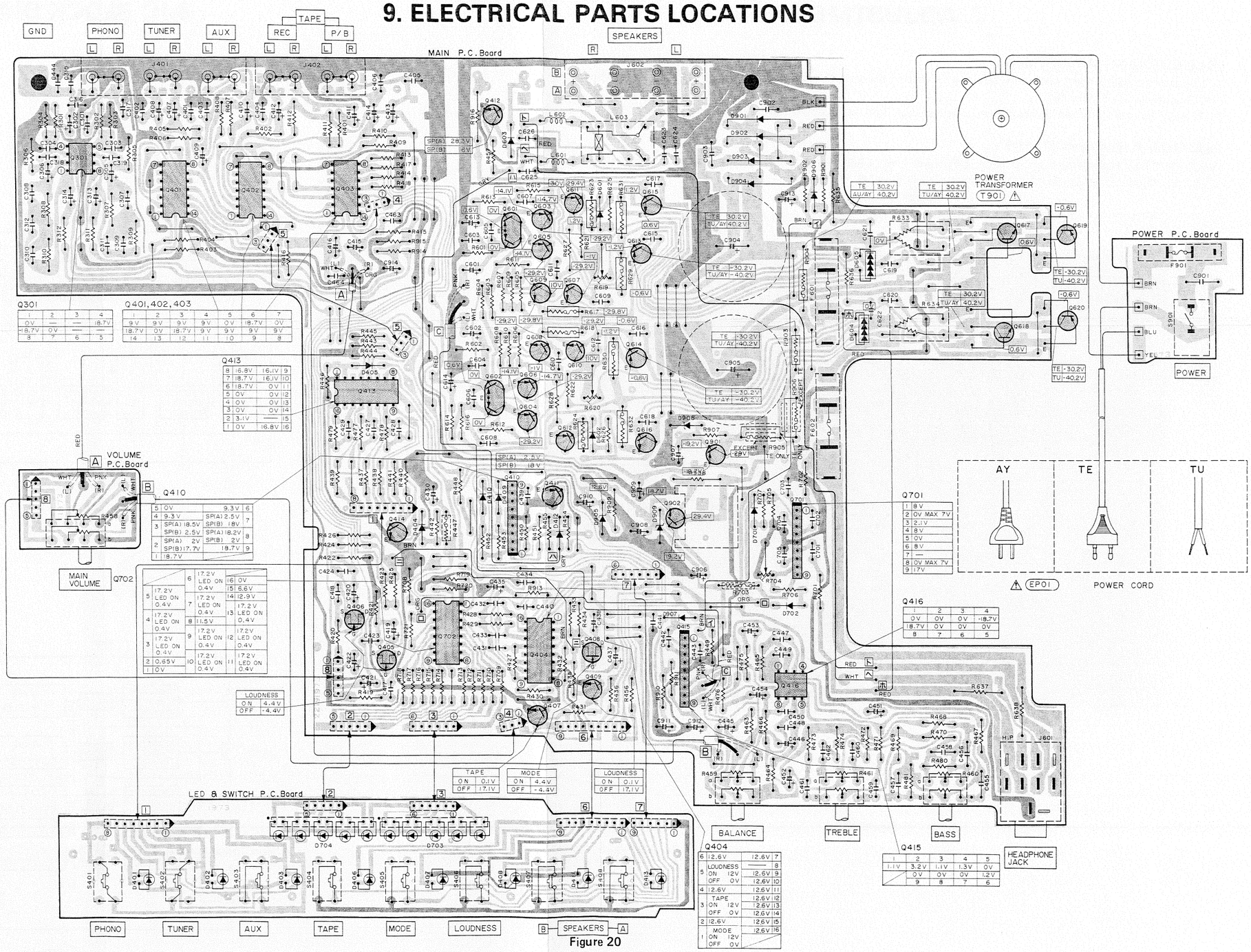
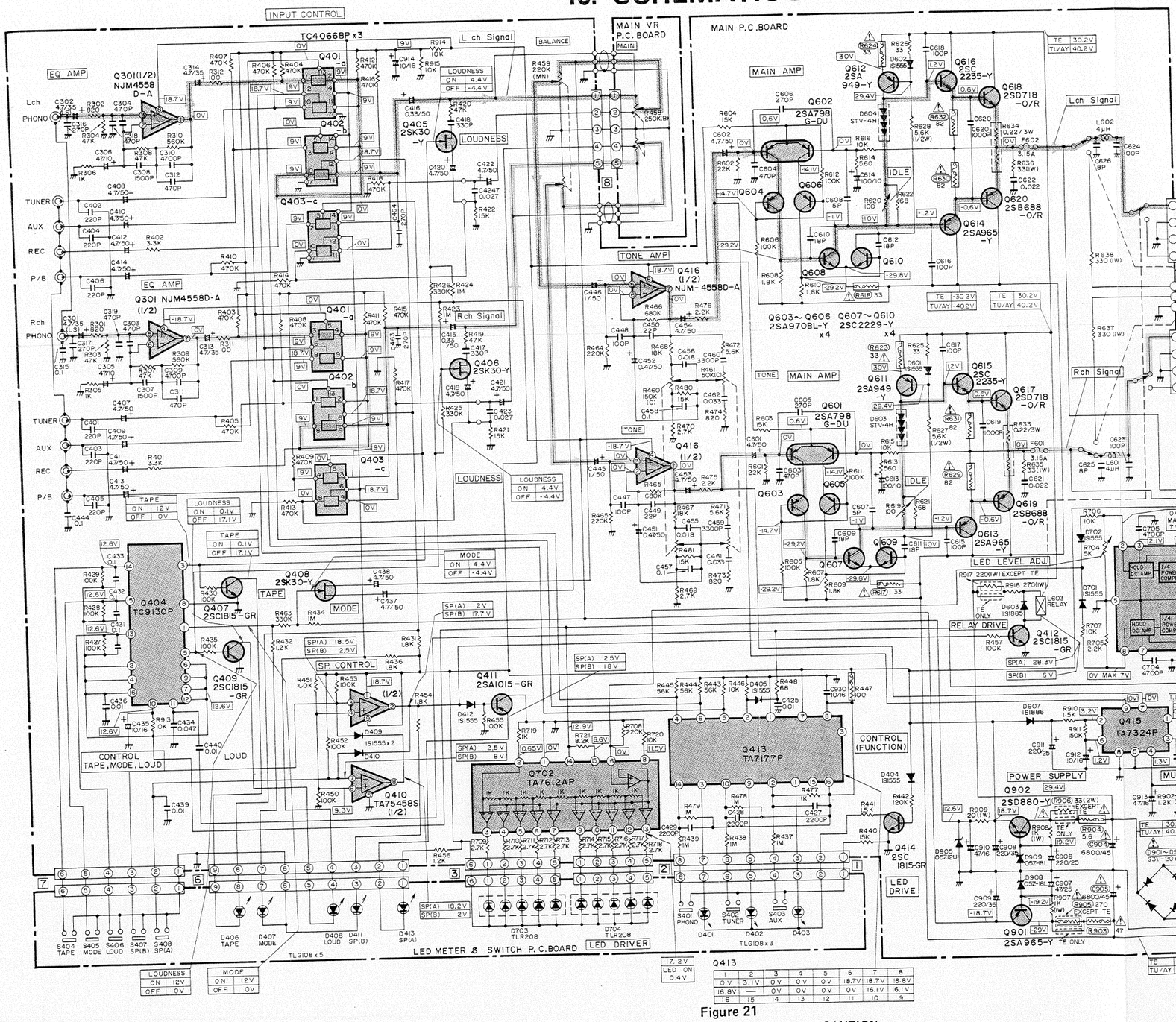


Figure 20

10. SCHEMATIC DIAGRAM



Q413	1	2	3	4	5	6	7	8
	0V	3.1V	0V	0V	0V	18.7V	18.7V	16.8V
	16.8V	—	0V	0V	0V	0V	16.1V	16.1V
	16	15	14	13	12	11	10	9

1)
S401 Key Switch (PHONO) OFF Position
S402 Key Switch (TUNER) OFF Position
S403 Key Switch (AUX) OFF Position
S404 Key Switch (TAPE) OFF Position
S405 Key Switch (MODE) OFF Position
S406 Key Switch (LOUDNESS) OFF Position
S407 Key Switch (SP B) OFF Position
S408 Key Switch (SP A) OFF Position

2)
S901 Push Switch (POWER) OFF Position

3)
All resistance values are indicated in ohms.
K=1000, M=1000000
All capacitance values are indicated in microfarads.
P=1/10^12
Electrolytic capacitor indicates ⊣⊢ / ⊣⊢
Working Voltage (V)
Capacitance (μF)
All resistors are carbon film 1/4W, ±5% unless.

Figure 21

CAUTION:
The mark, the symbol No. circled with rectangle in the schematic diagram and the shaded area in the parts list designate components which have special characteristics important for safety and should be replaced only with types identical to those in the original circuit or specified in the parts list.

11. CABINET PARTS LOCATIONS

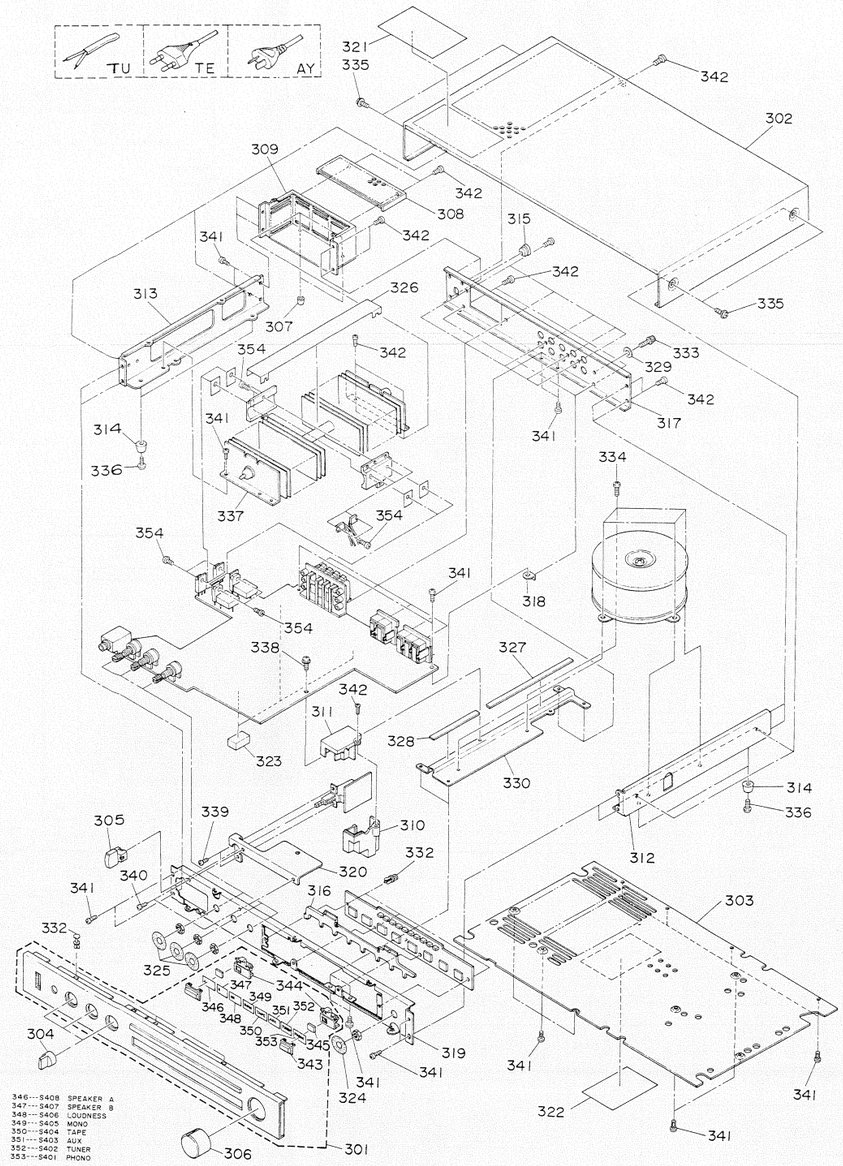


Figure 22

NOTE: Parts excluded in the Parts List are not available as replacement parts.

12. PARTS LIST

CAUTION:
The ⚠ mark, the symbol No. circled with rectangle in the schematic diagram and the shaded area in the parts list designate components which have special characteristics important for safety and should be replace only with types identical to those in the original circuit or specified in the parts list.

	Symbol No.	Part No.	Description
	CABINET PARTS		
	301	20017169	Panel Ass'y, Front
	302	20015260	Cover, Top
	304	25837649	Knob, Select B
	305	22824350	Knob Ass'y, Power
	306	22824370	Knob Ass'y, Volume
	314	22828078	Foot
⚠	315	25845528	Bush, Nylon
	317	20015265	Plate, Jack (TU, AY)
	317	20015236	Plate, Jack (TE)
	321	22864401	Label, Caution
	322	22864461	Label, Name (TE)
	322	22864462	Label, Name (TU, AY)
	324	22758058	Sheet, Mask 40
	325	22758264	Sheet, Mask 30
	329	22703189	Washer
	332	22705020	Rivet, Plastic, 3ϕ x 4.5mm
	333	20794122	Screw
	334	22707040	Screw, FT BID, 4ϕ x 6mm
	335	22707522	Screw, FL DT, 3ϕ x 6mm
	336	22701393	Screw, PAN Tapping, 3ϕ x 10mm
	337	20036076	Radiator, Heat Pipe
	338	22707361	Screw, TPAN, 2.6ϕ x 8mm
	339	22701313	Screw, BID, 3ϕ x 4mm
	340	22707066	Screw, BID, 3ϕ x 6mm
	341	22701237	Screw, BID Tapping, 3ϕ x 6mm
	342	22701326	Screw, BID Tapping, 3ϕ x 8mm
	343	22884107	Button, Push
	344	20874244	Case, Reflect
	345	20847245	Filter, Button
	346	22838128	Sheet, A
	347	22838138	Sheet, B
	348	22838139	Sheet, Loudness
	349	22838140	Sheet, Mode
	350	22838141	Sheet, Tape
	351	22838142	Sheet, AUX
	352	22838143	Sheet, Tuner
	353	22838144	Sheet, Phono

Symbol No.	Part No.	Description
TRANSISTORS & IC'S		
Q301	22114470	IC, NJM4558D-A
Q401, 402		IC, TC4066BP
Q403		
Q404		IC, TC9130P
Q405, 406		Transistor, 2SK30A-Y
Q408		
Q407, 409		Transistor, 2SC1815-GR
Q410		IC, TA75458S
Q411		Transistor, 2SA1015-GR
Q412		Transistor, 2SC1815-GR
Q413		IC, TA7177P
Q414		Transistor, 2SC1815-GR
Q415		IC, TA7324P
Q416	22114470	IC, NJM4558D-A
Q601, 602	22114468	Transistor, 2SA798-G-DU
Q603, 604		Transistor, 2SA970-BL
Q605, 606		
Q607, 608		Transistor, 2SC2229-Y
Q609, 610		
Q611, 612		Transistor, 2SA949-Y
Q613, 614		Transistor, 2SA965-Y
Q615, 616		Transistor, 2SC2235-Y
Q617, 618		Transistor, 2SD718-O/R
Q619, 620		Transistor, 2SB688-O/R
Q701		IC, TA7318P-2
Q702		IC, TA7612AP
Q901		Transistor, 2SA965-Y
Q902		Transistor, 2SD880-Y
DIODES		
D401, 402		Diode, TLG108
D403, 406		
D404, 405		Diode, 1S1555V
D407, 408		Diode, TLR108
D409, 410		Diode, 1S1555V
D411, 413		Diode, TLG108
D412		Diode, 1S1555V
D601, 602		Diode, 1S1555V
D603		Diode, 1S1885
D604, 605	22115664	Diode, STV-4H-GRN

Symbol No.	Part No.	Description
D701, 702		Diode, 1S1555V
D703, 704		Diode, TLR208-5
⚠ D901, 902	22115496	Diode, S3V20-X
⚠ D903, 904		
D905		Diode, 05Z12U
D906		Diode, 1S1553V
D907		Diode, 1S1886
D908, 909		Diode, 05Z18-L

ELECTRICAL PARTS

⚠ T901	22223999	Transformer, Power (TE)
⚠ T901	22224001	Transformer, Power (TU)
⚠ T901	22224002	Transformer, Power (AY)
F601, 602	22144365	Fuse, 3.15A/250V
⚠ F901	22144357	Fuse, T1.25A/250V
L601, 602	22210152	Coil, 4μH
L603	22148670	Relay
S401	22195145	Switch, Key (Phono)
S402	22195145	Switch, Key (Tuner)
S403	22195145	Switch, Key (Aux)
S404	22195145	Switch, Key (Tape)
S405	22195145	Switch, Key (Mono)
S406	22195145	Switch, Key (Loudness)
S407	22195145	Switch, Key (Speaker B)
S408	22195145	Switch, Key (Speaker A)
⚠ S901	22195631	Switch, Push (Power)
J401	22163830	Jack, US6P
J402	22163831	Jack, US4P
J601	22162457	Terminal, Speaker
J602	22163744	Jack, Headphone
⚠ EP01	22176286	Cord, Power (TE)
⚠ EP01	22176628	Cord, Power (TU)
⚠ EP01	22176588	Cord, Power (AY)

CAPACITORS

D = ±0.5pF, J = ±5%, K = ±10%, M = ±20%,
Q = −10 + 30%, Z = −20 + 80%
ABBREVIATIONS: CD = Ceramic Disk, EL = Electrolytic
MY = Mylar Film, BL = Barrier Layer
PP = Polypropylene

C301, 302	22467479	EL, 4.7mfd, 35V, LS
C303, 304	22349471	CD, 470pF, 50V, K
C305, 306	22483470	EL, 47mfd, 10V, M
C307, 308	22371152	MY, 1500pF, 50V, J
C309, 310	22371472	MY, 4700pF, 50V, J
C311, 312	22321053	PP, 470pF, 50V, J
C313, 314	22488479	EL, 4.7mfd, 35V, M
C315	22360333	BL, 0.1mfd, 25V, M
C316, 317	22361270	CD, 27pF, 50V, J
C318, 319	22349471	CD, 470pF, 50V, K
C401, 402	22349221	CD, 220pF, 50V, K
C403, 404	22349221	CD, 220pF, 50V, K
C405, 406	22349221	CD, 220pF, 50V, K
C407, 408	22488479	EL, 4.7mfd, 50V, M
C409, 410	22488479	EL, 4.7mfd, 50V, M
C411, 412	22488479	EL, 4.7mfd, 50V, M
C413, 414	22488479	EL, 4.7mfd, 50V, M
C415	22480006	EL, 0.33mfd, 50V, K
C416	22488338	EL, 0.33mfd, 50V, M
C417, 418	22349331	CD, 330pF, 50V, K
C419, 420	22488479	EL, 4.7mfd, 50V, M
C421, 422	22488479	EL, 4.7mfd, 50V, M
C423, 424	22371273	MY, 0.027mfd, 50V, J
C425	22342103	CD, 0.01mfd, 50V, Z
C426	22349102	CD, 1000pF, 50V, Z
C427, 428	22349222	CD, 2200pF, 50V, K
C429	22349222	CD, 2200pF, 50V, K
C430	22485100	EL, 10mfd, 16V, M
C431, 432	22360333	BL, 0.1mfd, 25V, M
C433		
C434	22360331	BL, 0.047mfd, 25V, M
C435	22485100	EL, 10mfd, 16V, M
C436	22360327	BL, 0.01mfd, 25V, M
C437	22488479	EL, 4.7mfd, 50V, M
C438	22488479	EL, 4.7mfd, 50V, M
C439	22360327	BL, 0.01mfd, 25V, M
C440	22360327	BL, 0.01mfd, 25V, M
C442	22343102	CD, 1000pF, 50V, M
C443	22360327	BL, 0.01mfd, 25V, M
C444	22360333	BL, 0.1mfd, 25V, M
C445, 446	22488109	EL, 1mfd, 50V, M
C447, 448	22349101	CD, 100pF, 50V, K
C449, 450	22349220	CD, 22pF, 50V, K
C451, 452	22488478	EL, 0.47mfd, 50V, M
C453, 454	22488479	EL, 4.7mfd, 50V, M
C455, 456	22371183	MY, 0.018mfd, 50V, J
C457, 458	22371104	MY, 0.1mfd, 50V, J
C459, 460	22371332	MY, 3300pF, 50V, J
C461, 462	22371333	MY, 0.033mfd, 50V, J
C601, 602	22488479	EL, 4.7mfd, 50V, M
C603, 604	22349471	CD, 470pF, 50V, K
C605, 606	22349271	CD, 270pF, 50V, K
C607, 608	22361509	CD, 5pF, 50V, D
C609, 610	22362180	CD, 18pF, 50V, K
C611, 612	22362180	CD, 18pF, 50V, K
C613, 614	22483101	EL, 100mfd, 10V, M
C615, 616	22362101	CD, 100pF, 50V, K
C617, 618	22362101	CD, 100pF, 50V, K
C619 620	22371102	MY, 1000pF, 50V, J
C621, 622	22372223	MY, 0.022mfd, 50V, K
C623, 624	22362101	CD, 100pF, 50V, K
C625, 626	22361809	CD, 8pF, 50V, D

Symbol No.	Part No.	Description
C701, 702	22360331	BL, 0.047mfd, 25V, M
C703	22360333	BL, 0.1mfd, 25V, M
C704, 705	22349472	CD, 4700pF, 50V, K
⚠ C901	22340150	CD, 4700pF, 400V, M
⚠ C902, 903	22372104	MY, 0.1mfd, 50V, K
⚠ C904, 905	22440455	EL, 6800mfd, 50V, M
C906	22486221	EL, 220mfd, 25V, M
C907	22486470	EL, 47mfd, 25V, M
C908, 909	22487221	EL, 220mfd, 35V, M
C910	22485470	EL, 47mfd, 16V, M
C911	22486221	EL, 220mfd, 25V, M
C912	22485100	EL, 10mfd, 16V, M
C913	22485470	EL, 47mfd, 16V, M
C914	22485100	EL, 10mfd, 16V, M
RESISTORS All resistors are carbon film ¼W, ±5%, unless otherwise noted.		
R301, 302	22545821	820 ohm
R303, 304	22545473	47K ohm
R305, 306	22545102	1K ohm
R307, 308	22545473	47K ohm
R309, 310	22545564	560K ohm
R311, 312	22545101	100 ohm
R401, 402	22545332	3.3K ohm
R403, 404	22545474	470K ohm
R405, 406		
R407, 408		
R409, 410		
R411, 412		
R413, 414		
R415, 416		
R417, 418		
R419, 420	22545473	47K ohm
R421, 422	22545153	15K ohm
R423, 424	22545105	1M ohm
R425, 426	22545334	330K ohm
R427, 428	22545104	100K ohm
R429	22545104	100K ohm
R430	22545104	100K ohm
R431	22545182	1.8K ohm
R432	22545122	1.2K ohm
R433	22545334	330K ohm
R434	22545105	1M ohm
R435	22545104	100K ohm
R436	22545182	1.8K ohm
R437, 438	22545105	1M ohm
R439		
R440	22545153	15K ohm
R441	22545152	1.5K ohm
R442	22545124	120K ohm
R443, 444	22545563	56K ohm
R445		
R446	22545103	10K ohm
⚠ R447	22500122	100 ohm Fusible

Symbol No.	Part No.	Description
R448	22545680	68 ohm
R449	22545223	22K ohm
R450, 451	22545104	100K ohm
R452, 453	22545104	100K ohm
R454	22545182	1.8K ohm
R455	22545104	100K ohm
R456	22545122	1.2K ohm
R457	22545104	100K ohm
R458	22628415	250K ohm, B, Variable (MAIN)
R459	22651646	250K ohm, W, Variable (BALANCE)
R460, 461	22651548	50K ohm, C, Variable(TONE)
R463, 464	22545224	220K ohm
R465, 466	22545684	680K ohm
R467, 468	22545183	18K ohm
R469, 470	22545272	2.7K ohm
R471, 472	22545562	5.6K ohm
R473, 474	22545821	820 ohm
R475, 476	22545222	2.2K ohm
R477, 478	22545105	1M ohm
R479		
R480, 481	22545153	15K ohm
R601, 602	22545223	22K ohm
R603, 604	22545153	15K ohm
R605, 606	22545104	100K ohm
R607, 608	22545182	1.8K ohm
R609, 610	22545182	1.8K ohm
R611, 612	22545104	100K ohm
R613, 614	22545561	560 ohm
R615, 616	22545103	10K ohm
⚠ R617, 618	22500177	33 ohm, Fusible
R619, 620	22658576	100 ohm, Semi-fixed
R621, 622	22545680	68 ohm
⚠ R623, 624	22500177	33 ohm, Fusible
R625, 626	22545330	33 ohm
R627, 628	22547562	5.6K ohm, ½W
⚠ R629, 630	22500180	82 ohm, Fusible
⚠ R631, 632	22500180	82 ohm, Fusible
⚠ R633, 634	22500260	0.22 ohm, 3W, Wire Wound
R635, 636	22570256	33 ohm, 1W, Metal Oxied Film
R637, 638	22570268	330 ohm, 1W, Metal Oxied Film
R701, 702	22545273	27K ohm
⚠ R703	22500122	100 ohm, Fusible
R704	22658513	5K ohm, Semi-fixed
R705	22545222	2.2K ohm
R706	22545103	10K ohm
R707	22545103	10K ohm
R708	22545224	220K ohm
R709, 710	22545272	2.7K ohm

Symbol No.	Part No.	Description
R711, 712 R713, 714 R715, 716 R717, 718	22545272	2.7K ohm
R719	22545102	1K ohm
R720	22545103	10K ohm
R721	22545822	8.2K ohm
R901	22545822	8.2K ohm
R902	22545122	1.2K ohm
⚠ R903	22500119	47 ohm, Fusible
⚠ R904	22500170	5.6 ohm, Fusible
⚠ R905	22500135	270 ohm, Fusible (TU, AY)
⚠ R906	22570301	33 ohm, 2W, Metal Film (TU, AY)
R907	22570274	1K ohm, 1W, Metal Oxied Film
R908	22570274	1K ohm, 1W, Metal Oxied Film
R909	22570263	120 ohm, 1W, Metal Oxied Film
R910	22545152	1.5K ohm
R911	22545154	150K ohm
R913	22545103	10K ohm
R914	22545103	10K ohm
R915	22545103	10K ohm
R916	22570267	270 ohm, 1W, Metal Oxied Film
R917	22570266	220 ohm, 1W, Metal Oxied Film

ACCESSORY

AC01	22903049	Owner's Manual

Symbol No.	Part No.	Description